previous knowledge of the science for granted, the elementary facts upon which the chief everyday applications of electricity are based. The volume on wild flowers contains two hundred black and white illustrations of common flowers, and descriptions of these and others arranged in chapters according to their colours. Thus we have chapters on white, yellow, red, blue, flowers, and so on. The price of each volume in the series is 6*d*. net.

OUR ASTRONOMICAL COLUMN.

STARS WITH VARIABLE RADIAL VELOCITIES.—In the *Astrophysical Journal* for January (vol. xxxix., No. 1, p. 39) Mr. Oliver J. Lee contributes numerous measures of variable radial velocities of stars determined in the course of measuring Bruce spectrograms. Of the twenty-eight stars to which reference is made, eighteen have been previously announced as spectroscopic binaries, but the remaining ten are new. The following table is abstracted from the information given in the paper, and indicates the star in question, position, magnitude, and class :—

Star	R.A. h. m.	Dec. ° ′	Mag.	Class
89*f* Piscium	1 13	+ 3 5	5·3	A_2
73 ξ^2 Ceti	2 23	+ 8 1	4·3	A
125 Tauri	5 34	+25 50	5·0	B_3
40 Aurigæ	6 0	+38 30	5·3	A
24 Can. Ven.	13 30	+49 32	4·6	A_3
33 Boötis	14 35	+44 50	5·4	A
27 β Libræ	15 12	− 9 1	2·7	B_8
BD 25°4165	20 11	+25 17	4·8	B_3
33*i* Aquarii	22 1	−14 21	4·4	B_8
18 λ Piscium	23 37	+ 1 14	4·6	A_5

SUN-SPOTS: THEIR INTERNAL MOTION AND SHORT-PERIOD VARIATIONS.—The fifth volume of the *Publikationen der Sternwarte des Eidg. Polytechnikums zu Zurich* contains two contributions, the first by William Brunner, on the investigation of the internal motions in sun-spots, and the second by Elsa Frenkel, on short-period variations in the frequency of sun-spots. The former is a detailed research, carried out in a systematic manner, on the internal motions, chiefly divergent. The chief result leads the author to associate this divergent motion with the origin and development phases of spot groups. The data employed were those of the period between January 1, 1887, and January 1, 1905, and were the result of observations made with the refractor of the Zurich Observatory. Numerous plates accompany the text. The second paper involves the discussion of the Zurich observations made during the period 1876–1911. Readers must refer to the original publication for the detailed account of the research, but the chief conclusions may be stated briefly as follows. The author finds a probable period of 200 days, but this is not apparent during the last three eleven-year periods, when the spot activity went below a certain limit. The length is not constant, but varies about a mean value of 150 to 200 days. The ordinate of the periodigram is about 100 times smaller than the eleven-year period, and the amplitude about ten times smaller than that of the eleven-year period. Another period of 68·5 days was indicated, but this will be investigated again at a later date. Attention is directed to the lengths of these two periods, namely 200 and 68·5 days, and the sidereal times of revolution of the two inner planets, namely Mercury, 87·9 days, and Venus, 224·7 days. The text is accompanied by a large number of plates showing the observed and smoothed curves of the daily relative numbers.

DETERMINATIONS OF GRAVITY IN EGYPT AND THE SUDAN.—Survey Department Paper No. 18 (Cairo) contains details of the determination of "g" at eight stations in Egypt and the Sudan, carried out by Mr. P. A. Curry, in connection with the geodetic survey. Almost the whole of the observations and the whole of the computational work have been done by Mr. Curry himself. The stations range from Helwân to Khartoum, nearly 15° of latitude, and the height above sea-level varies from 42 to 383 metres, but the topographical correction has been *nil* for each of the stations. The Stuckrath pendulum apparatus employed was borrowed from the South Kensington Museum, where it had been deposited after the return of Captain Scott's first Antarctic Expedition. This instrument provides essentially for the determination of the time of oscillation of each of a number of invariable pendulums swinging in separate cells of a vacuum chamber. Besides the correction due to the rate of the chronometer, *four* instrumental corrections need to be determined, namely, for temperature, pressure, amplitude of vibration, and flexure of pillar. Kew was taken as the base and Helwân was made the primary Egyptian station. 981·201 cm./sec.^2 (based on the Potsdam system) was adopted as the value of "g" at Kew, and from a discussion of *ninety-eight* separate determinations 979·295 cm./sec.^2 was obtained as the final value of this constant at Helwân, the probable error being ±0·0027. The values obtained for each of the stations have been reduced to sea-level and compared with the theoretical value for the latitude of the station given by Helmert's formula (1901). Remarkably close agreement obtains, ranging only between +0·009 and −0·013, whence it is concluded that there is nothing very abnormal about the values of gravity at these eight stations.

THE COBAR COPPER FIELD.

COBAR, on the western plains of New South Wales, 464 miles by railway from Sydney, is one of the most important, though not most profitable, of the copper fields in Australia; it yielded 6500 tons of copper in 1911, and has produced more than 90,000 tons since its discovery in 1869. The development of the field was hampered by its remote position and its semi-arid climate, for with a rainfall of only 15 in. it is surrounded in dry seasons by a wide, waterless tract. In its early days, however, the export of ore was once stopped by floods, which inundated the plains beside the Darling River for a width of fifty miles. Another trouble was an invasion in 1890 by millions of rabbits, which destroyed the vegetation by devouring the shrubs and ring-barking the trees.

The rocks of the mining field belong to three main divisions.[1] The oldest is the Cobar Series, which comprises semi-metamorphic sediments of perhaps pre-Silurian age; its most important member consists of thick beds of chert, which Mr. Andrews regards as a recrystallised organic precipitate. The account of these beds suggests their resemblance to the Heathcotian Series of Victoria, which are of Cambrian age. The middle division, the Mallee Tank beds, includes fossiliferous limestones, and its age is certainly Silurian. The upper division is Devonian, and includes a varied series of quartzites, shales, and claystones. The rocks of all three divisions have been disturbed by intense compression due to earth movements at the beginning and at the end of the Devonian period. The pressure was so powerful that the minimum dip observed in the Silurian rocks is 30°, and the Devonian

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[1] E. C. Andrews: Report on the Cobar Copper and Gold-field. Part i. (Department of Mines, New South Wales, Mineral Resources, No. 17). 1913, xi. Pp. 207+xlv plates+19 maps in separate portfolio.

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rocks have been overthrust and the pebbles in the conglomerates sheared and shattered. One striking feature of this mining field is the rarity of igneous rocks; they are represented only by two small pipes of orthoclase-porphyry, which appear to have no connection with the ores. The mineral deposits are attributed by Mr. Andrews to the post-Devonian earth movements. Certain features suggested that they might be bedded ores; but, as so often happened with ores so regarded, more detailed study has shown that they are of secondary origin. They have been formed in connection with great fault movements and by the replacement of slate by sulphides. This conclusion is definitely established by Mr. Andrews's excellent monograph, which includes a detailed account of the geology, history, and mines of this field.

The chief copper-bearing mineral is chalcopyrite, and it is associated with pyrrhotite, ordinary iron pyrites, and a silicate of iron, which is identified by Mr. Card as ekmannite. The ores have undergone great secondary concentration, which Mr. Andrews attributes, with great probability, to the arid climate and prolonged stability of the field. Ever since the post-Devonian disturbances the country does not appear to have been affected by any earth movements except some minor oscillations; and the level has only been lowered by denudation about 200 ft., according to Mr. Andrews's estimate, during all later geological times. The chemical analyses are of especial value owing to the determination of an unusually large number of constituents. The description of the field is illustrated by a series of plates, some of which are coloured, showing the intimate structure of the ores and the relation of their constituent minerals; and the memoir is accompanied by a portfolio of maps and mine plans. All the separate mines are described in detail. The discussion of the ores shows wide acquaintance with the recent literature on the subject, and the author's conclusions command respect owing to the obvious care and accuracy with which the work has been conducted. The author's view that magnetite is formed only under conditions of great heat is perhaps too general, and the remark that the Murray River enters the sea near Adelaide might mislead a reader who is not used to judging proximity by Australian standards of distance. J. W. G.

PUBLIC HEALTH.

WE have received the report, for 1912–13, of the Medical Officer of the Local Government Board. There is no greater authority than Dr. Newsholme on all matters of public health, and every page of his report should be read by all who care for our national health and efficiency. Among many other subjects of interest, he directs attention to the practical problems of "typhoid carriers," the present rather threatening facts of cerebro-spinal fever and poliomyelitis, and the contrast of the steady decline of scarlet fever, diphtheria, and typhoid, with the obduracy of measles. Of smallpox, 121 cases were notified during 1912 in England and Wales, but only nine died. It may be worth noting that, in one household, three small children died, whose parents had declined vaccination for them.

Tuberculosis, naturally, occupies a great part of Dr. Newsholme's report. For, beside the grant of some 60,000*l.* annually for research, the year 1912–13, as Dr. Newsholme says, "will always stand out as a landmark in the history of the administrative control of tuberculosis. During this year the Board made all forms of tuberculosis compulsorily notifiable; the provisions of the National Insurance Act, 1911, as to sanatorium benefit, came into operation; the capital grant under the Finance Act, 1911, of 1½ millions sterling for the provision of institutions for the treatment of tuberculosis in the United Kingdom, became available; and the important offer was made by the Treasury to defray one-half of the annual cost of schemes for the treatment of tuberculosis, proposed by local authorities and approved by the Local Government Board, which are available for the entire population, after deducting any contribution received from the local insurance committee or from other sources." Other points of interest, in Dr. Newsholme's report, touch the work of the Medical Department of the Board; the work of the International Health Office, the International Sanitary Conference in Paris, 1912, and other services rendered to the public by the Medical Department.

After Dr. Newsholme's report, come Dr. Bruce Low's admirable and authoritative monographs on plague, cholera, and yellow fever, giving a full account of the incidence on the world, during 1911 and 1912, of these three scourges. Then comes a great number of shorter reports. Altogether, this volume is of singular value to all who are concerned—and who is not?—with the health and safeguarding of our country.

FORTHCOMING BOOKS OF SCIENCE.

Agriculture.

A. and C. Black.—The World's Cotton Crops, Prof. J. A. Todd, illustrated. *Crosby Lockwood and Son.*—Agriculture: Extensive and Intensive, Prof. J. Wrightson, in conjunction with J. C. Newsham.

Anthropology and Archæology.

John Bale, Sons and Danielsson, Ltd.—Hausa Folk-Tales, Major A. J. N. Tremearne. *Chatto and Windus.*—A History of Babylonia and Assyria from Prehistoric Times to the Persian Conquest, L. W. King, illustrated, vol. ii., A History of Babylon from the Foundation of the Monarchy to the Persian Conquest, vol. iii., A History of Assyria from the Earliest Period to the Fall of Nineveh. *Constable and Co., Ltd.*—Amulets, Prof. W. M. Flinders Petrie, F.R.S., illustrated; Kinship and Social Organisation, Dr. W. H. R. Rivers, F.R.S. *Macmillan and Co., Ltd.*—Knossian Atlas, edited by Sir A. J. Evans, F.R.S., vol. i., The Wall Paintings, including coloured lithographic plates i.–xiii., from drawings by E. Gilliéron, with short descriptive sketch by the editor (to which are appended Lumière illustrations), and Notes on the Technique of the Frescoes by N. Heaton; The Nine Minoan Periods, a Summary Sketch of the Characteristic Stages of Cretan Civilization, from the Close of the Neolithic to the Beginning of the Iron Age, Sir A. J. Evans, F.R.S., illustrated; The Eastern Libyans, O. Bates, illustrated; Marriage Ceremonies in Morocco, Prof. E. Westermarck; The Native Tribes of the Northern Territory of Australia, Prof. W. B. Spencer, C.M.G., F.R.S., illustrated. *The Medici Society, Ltd.*—Mexican Archæology: An Introduction to the Archæology of the Mexican and Mayan Civilizations of Pre-Spanish America, Thomas A. Joyce, illustrated. *Methuen and Co., Ltd.*—The Nomads of the Balkans, A. J. B. Wace and M. S. Thompson, illustrated. *Oxford University Press.*—Contributions to Anthropology: vol. i., Coos Texts, J. Frachtenberg, vol. ii., The Ethnology of the Salish Tribes, J. A. Teit. *G. P. Putnam's Sons.*—The Folk-Ballads of Southern Europe, S. Jewett. *Williams and Norgate.*—The Antiquity of Man, Prof. A. Keith, F.R.S.

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